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The Question of a Frugal Mindset in Western MNCs –

Exploring an Emerging Phenomenon with a Systematic Literature Review

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Abstract

Frugal innovation in the context of developed economies has witnessed increasing interest in recent years. For Western multinational companies (MNCs) emerging markets represent promising opportunities for growth as well as the threat of new local competitors. Furthermore, economic developments drive the demand for frugal products within Western countries. Successfully mastering this challenge means that Western MNCs have to challenge prevailing paradigms within their organizations. Literature suggests that these companies have to develop a frugal mindset to succeed in frugal innovation. However, to the best of our knowledge no publication addresses the phenomenon on an empirical basis or provides enough detail for further empirical investigation. To address this gap, we conducted a systematic literature review of 80 publications in the frugal innovation field. Building on the theoretical background of the global mindset concept, we assume that a mindset is a cognitive orientation that promotes task completion, which in turn improves task performance. Our qualitative analysis suggests that in the context of frugal innovation improved task performance would positively contribute to the following goals: (1) strategic alignment of innovating for cost conscious consumers, especially in emerging markets (2) deepening the understanding of cognitively remote customers' needs and the context in which they live or work and (3) satisfaction of these customers' needs with frugal solutions. Furthermore, we propose that a frugal mindset can be cultivated along the phases of (1) accepting the new realities of changing markets and competition, (2) a willingness to reconsider current approaches and (3) a willingness to take the necessary action and implement new approaches regarding the identified goals. By developing a definition based on this two-dimensional construct, we build on the theoretical foundations of a well-established mindset concept from the field of organizational behavior/strategic management and integrate various descriptions of the frugal mindset. This contribution provides a solid theoretical basis for further research.

Keywords: Frugal Innovation, Frugal Mindset, Global Mindset, Organizational Behavior, Path Dependency

1 Introduction

Frugal innovation, a phenomenon which originated in the context of emerging economies is increasingly receiving interest from researchers and practitioners in western countries (Tiwari & Kalogerakis, 2016). The three defining criteria of frugal innovations are substantial cost reduction, concentration on core functionalities, and optimized performance level (Weyrauch & Herstatt, 2016). Considering these criteria, a discussion focusing on emerging economies is reasonable. Hence, significantly cheaper products or services offer financially restricted and often

unserved customers the opportunity for consumption (Prahalad & Hart, 2002; Soni & Krishnan, 2014). Similar concepts like grassroots innovation (Gupta, 2012) reverse innovation (Govindarajan & Trimble, 2012) and the discussion around the "bottom of the pyramid" (Prahalad & Hart, 2002) are also focused on rapidly developing countries like India. Frugal innovations offer an opportunity to gain market shares in emerging markets or they can be a defense strategy against local low-cost competitors (Ernst, Kahle, Dubiel, Prabhu, & Subramaniam, 2015; Zeschky, Widenmayer, & Gassmann, 2011), that often dominate these markets (Ernst, Kahle, Dubiel, Prabhu, & Subramaniam, 2015). However, customer

preferences in respective market segments are assumed to differ radically from those in high end segments that are typically served by multinational corporations (Ernst, Kahle, Dubiel, Prabhu, & Subramaniam, 2015). Hence, innovating for customers and settings that differ substantially from those in the home market poses significant challenges, in this case especially for Western companies (Zeschky, Widenmayer, & Gassmann, 2011). Besides rather practical challenges, like potential geographical distance, organizations also need to manage internal challenges. A rich stream of research addresses these internal organizational challenges in the context of changes in the environment or management of innovation itself. Scholars discuss topics as diverse as the general situation of organizations facing market and technology changes (Christensen, 2013), specific rigidities within values, skills, managerial as well as technical systems that hamper innovation projects (Leonard-Barton, 1992) or the leadership behavior that supports successful change (Kotter, 1996). While the corporate culture is acknowledged as a potential antecedent for success in emerging markets (Ernst, Kahle, Dubiel, Prabhu, & Subramaniam, 2015), in the specific context of frugal innovation, the frugal mindset emerges as an important prerequisite for Western companies for successful development of frugal products, services and business models (Soni & Krishnan, 2014; Tiwari, Fischer, & Kalogerakis, 2016). Nevertheless, no publication has been identified that systematically addresses the phenomenon in detail. To the best of our knowledge, the paper addressing the frugal mindset in the most direct way is the proposed typology of the field of frugal innovation of Soni and Krishnan (2014). They disambiguate frugal innovation into three types: **a frugal mindset**, a frugal process and a frugal outcome. However, we believe that so far, the concept has not received due attention regarding to the specific aspects that exactly characterize a

frugal mindset. Soni and Krishnan (2014) discuss several theories to explain the concept in further detail, like bricolage, effectuation and the Jugaad mindset. Yet, their discussion focuses mainly on the back end of innovation and might therefore leave out other important aspects in the earlier phases. Additionally, most publications rather provide conceptual and anecdotal contributions. Consequently, one objective of this paper is an in-depth analysis of the frugal mindset phenomenon to provide a solid theoretical basis for further empirical investigation. We will build on Soni and Krishnan's (2014) suggestion that the three main actors of frugal innovation are grassroots entrepreneurs, domestic enterprises and MNC subsidiaries. Given their specific situation, we will take the perspective of MNCs. However, we argue that frugal innovation might as well be an international endeavor that is not limited to local subsidiaries, but can involve various business units including headquarters.

Consequently, we would like to explore the following three questions:

- (1) Why might a frugal mindset be important to realize the potential of frugal innovations for Western MNCs?
- (2) How can a frugal mindset be conceptualized for Western MNCs?
- (3) Can a frugal mindset be cultivated in Western MNCs?

In this publication, we will cumulate what is suggested and documented in the literature about the frugal mindset, integrate it and identify potential knowledge gaps. This is a crucial step to advance our understanding of the phenomenon and address further steps like operationalizing the frugal mindset. In this context, Soni and Krishnan (2014, p. 45) also suggest that "it would be a creative exercise to [...] identify proxies to measure frugal mindset [...]". From a more practical perspective, a nuanced understanding of the frugal mindset is a first step in developing actions to influence

and guide the prevailing mindset of any organization in the desired direction. The practical importance of dealing with this challenge was also revealed by Tiwari, Fischer and Kalogerakis (2016) in their study of frugal innovation in the scholarly and social discourse. With these objectives in mind, the paper is structured as follows. First, in section 2 we will provide a theoretical basis of mindsets in the management field to explore the frugal mindset further. Secondly, in section 3 we will outline the literature review as our research methodology. Subsequently, we will present and discuss our results in sections 4 and 5. Finally, we will summarize our results and discuss possible future research in section 6.

2 Theory of Mindsets

Before investigating the frugal mindset itself, it is important to develop a thorough understanding of the theory of mindsets in the context of management. Indeed, the frugal mindset is not the first mindset that is discussed in the management literature in a topic related to globalization. Gupta and Govindarajan (2002) discuss ways to cultivate a global mindset in the endeavor of organizations to prevail in a globalizing world. Gupta & Govindarajan (2002, p. 117) define a global mindset as one “that combines an openness to and awareness of diversity across cultures and markets with a propensity and ability to synthesize across this diversity.” The global mindset potentially addresses certain challenges that also apply to frugal innovation, due to its typical international setting. Nevertheless, it does not go into detail about how mindsets impact innovation related tasks that follow after a strategic decision to tackle a certain market. Therefore, the global mindset could, if at all, explain the perspective of management in the context of frugal innovation. Yet, “Frugal innovations seek to **create attractive value propositions** for their

targeted customer groups by focusing on core functionalities and thus minimizing the use of material and financial resources in the **complete value chain.**” (Tiwari, Fischer, & Kalogerakis, 2016, p. 17). Therefore, a frugal innovation endeavor does not end with the appreciation of diversity across markets, it also challenges functions along the whole value chain to come up with suitable solutions. For example, identifying and understanding the needs of customers in completely different contexts requires marketers to bridge a substantial cognitive distance, which is defined as “the extent of divergence between direct experience of me, here and now along the dimensions of time, space, social perspective, or hypothetically [probability]” (Liberman & Trope, 2014, p. 365). Continuing with this line of thought, knowing your potential customers’ needs and wants does not automatically provide a solution. Individuals, teams or organizations that want to achieve a certain goal without immediately knowing how to achieve it encounter what is defined as a problem (Baron, 1988). Hence, problem solving describes “any goal-directed sequence of cognitive operations directed at finding that unknown” (Jonassen, 2004, p. 6). Here, we assume that the solution means a frugal product, service or business model. In this context, it should be noted that for example German engineers are thought to be socialized in a system that rewards the development of complex high-tech solutions, as discussed in the study of Tiwari, Fischer and Kalogerakis (2016) of socio-economic impacts of frugal innovations in Germany. A fact that might impose challenges for product development teams and organizations, also in other western countries. Nevertheless, the global mindset is a well-established concept and especially Gupta and Govindarajan’s (2002) theoretical foundations on mindsets building on the work of Porac and Thomas (1990), Tversky and Kahneman (1986),

Walsh (1995) and other scholars provide ideal ground for further discussion.

Gupta and Govindarajan (2002) summarize their research on mindsets in five points that will now be discussed in detail and complemented with other relevant concepts.

- Referring to Gupta and Govindarajan (2002) human beings are **limited in their ability to absorb and utilize information**. Hence, they face an ongoing challenge to make sense of the complexity, ambiguity, and constant change of their information environment.
- The second point is accurately represented in this quote of economist Herbert Simon (2013): "The world you perceive is drastically simplified model of the real world.". Gupta and Govindarajan (2002) state that we address the challenge of information processing with a **process of filtration**. People are selective in what is absorbed and biased in how it is interpreted. These **cognitive filters** are described by the term **mindset**.
- Furthermore, Gupta and Govindarajan (2002) suggest that people's **mindsets are developed in an iterative way** and are hence results of their histories. The prevailing mindset determines the absorption and processing of new information. If any new bit of new information is compatible with the current cognitive filters, it supports that mindset. However, some information is truly new and requires a reconsideration of prevailing filtering mechanisms. Nevertheless, instead of changing one's mindset, one can also decide to reject the information. Referring to Gupta and Govindarajan (2002) the probability of such a mind-shift mainly depends on how self-aware a person is of the current mindset. Subconscious filters support the chance of rigidity and refusal of new information.
- Gupta and Govindarajan (2002) point out that organizations are collectivities of individuals and that these individuals are constantly

engaged in reshaping each other's mindset in their interactions. On a wider scale, one might argue that this also happens on a national level and other social collectivities. This view is also supported by Hofstede's (1991, p. 5) definition of culture: "[...] the collective **programming of the mind** which distinguishes the members of one category of people from another." Therefore, organizational and national culture as well as socialization are promising factors in the exploration of the frugal mindset. Furthermore, Gupta and Govindarajan (2002) note that mutual iterative reshaping is highly impacted by power distribution, context, purpose and other factors in the interaction of individuals. Consequently, the organization and distribution of decision-making power as well as influence have a significant impact on the **collective mindset**. The notion of a collective mindset should be emphasized at this point for a specific reason. Consistent with the previous definition, frugal innovation has implications on individuals along the entire value chain. Therefore, certain aspects of a frugal mindset might have more relevance on individuals of certain functions, while others might have less. Additionally, there might be interdependencies. To create a sufficient extensive understanding of the phenomenon, we assume that it is beneficial to explore the frugal mindset on an individual and organizational level of analysis. However, such an approach might create a level-of-analysis-problem and result in methodological and theoretical challenges (Eden & Spender, 1998).

- Finally, Gupta and Govindarajan (2002, p. 117) propose the following four mechanisms that can impact an organizational mindset:

- “(1) New experiences which cause a change in the mindsets of organizational members,
- (2) a change in the relative power of different individuals,

(3) a change in the organizational and social processes through which members meet and interact with each other, and

(4) a change in the mix of members comprising the firm such that the mindsets of new members differ from those departing.”

Arguably, a deeper investigation of these mechanisms would also require a discussion with regard to organizational change and change management, in general. However, the purpose of this paper is rather to investigate the necessity of changing towards a frugal mindset and establishing a goal state of this endeavor.

While Gupta and Govindarajan (2002) represents one of the most cited papers in the global mindset field, scholars still continue to investigate the phenomenon and alternative approaches and conceptualizations are being developed. A rather recent publication of Clapp-Smith and Lester (2014) reviews the two global mindset specific literature streams in strategic management and organizational behavior and concludes that they define and operationalize the global mindset in disparate ways. The authors further build on theories of cognitive psychology, which results in the

Table 1 Action Phases and Mindsets (Gollwitzer, 1990)

Action Phase	Task	Mindset Characteristics
Deliberation	Goal Setting	<ol style="list-style-type: none"> 1. Cognitive tuning toward information relevant to the issues of feasibility and desirability. 2. Orientation toward accurate and impartial processing of such information. 3. Open-mindedness or heightened receptivity to information in general.
Implementation	Planning	<ol style="list-style-type: none"> 1. Cognitive tuning toward information relevant to when, where, and how to act. 2. Closed-mindedness in the sense of concentrating on information that helps to promote the chosen goal. 3. Partial and optimistic analysis of information related to the chosen goal's desirability and feasibility.
Action taking	Executing	<ol style="list-style-type: none"> 1. Closedmindedness to information that could trigger a re-evaluation of the goal that is pursued, a re-evaluation of the chosen

operationalization of the global mindset as a dynamic process of mindset switching in which the most appropriate mindset for a situation can be primed to activate (Clapp-Smith & Lester, 2014). Furthermore, Clapp-Smith and Lester (2014) make another valuable theoretical contribution by building on the work of the German psychologist Peter M. Gollwitzer (1990). Gollwitzer (1990) proposes that goal-oriented behavior can be divided in the four phases of deliberation (or goal setting), implementation (or planning), action taking and evaluating. Furthermore, Gollwitzer (1990, S. 63) defines a mindset as a “(...) cognitive orientation that promotes task completion” and suggests that specific tasks within the phases of goal-oriented behavior also prime certain mindsets, which in turn results in processing information congruent with the current task and thus **leads to greater task performance**. This definition provides a strong argument to answer the question why a frugal mindset might be important for Western MNCs that strive to develop frugal innovations. Table 1 summarizes the action phases, their respective tasks and mindset characteristics according to Gollwitzer (1990).

		route toward goal attainment, or any self-evaluation.
		2. Cognitive tuning toward internal and external cues that guide the course of action toward goal attainment.
Evaluation	Evaluating	<ol style="list-style-type: none"> 1. Cognitive tuning toward information relevant to assessing the quality of the achieved outcome and the desirability of its consequences. 2. Orientation toward accurate and impartial processing of this information. 3. Comparative orientation; that is, the intended outcome and the desired consequences should be compared with the actual outcome and its consequences.

As discussed, frugal innovation is a multi-faceted endeavor and takes place along the whole value chain as well as innovation process (Tiwari, Fischer, & Kalogerakis, 2016). Consequently, individuals with different organizational functions will be engaged in goal-oriented behavior with different specific goals and respective tasks to be completed. Therefore, our suggestion that the frugal mindset is a multi-faceted phenomenon remains.

A theory, even if it is only starting to emerge should also be able to integrate prevailing theories that strive to explain similar deviations from existing paradigms (Sarasvathy, 2001). Hence, we will discuss the suggested concepts of Soni and Krishnan (2014) to depict their understanding of the frugal mindset. Soni and Krishnan (2014) offer Jugaad, bricolage, effectuation, improvisation, Gandhian innovation and inclusive innovation as relevant antecedents. Based on a review of the concepts, we will focus our discussion on improvisation, bricolage and effectuation. Since these provide promising ground for a deeper understanding of our emerging theory of the frugal mindset.

Improvisation

In an extensive review of improvisation among a variety of fields and studies regarding improvisation, Moorman and Miner (1998) define organizational improvisation as the

degree to which the composition and execution of an action converge in time. Moorman and Miner (1998) also acknowledge that their use of the term composition implies that the improvisational activity involves some degree of innovation, because it goes beyond automatically repeating a pre-existing routine. In that, the concept of improvisation applies to our framework in two ways. Firstly, it distinguishes between the action phases of composing (planning) and implementing and suggests that in improvisation they converge in time. Secondly, it suggests that improvised actions derive from the routines that are usually applied to do things. If we acknowledge the relevance of improvisation for the frugal mindset, we would therefore expect that the frugal mindset facilitates individuals to be more comfortable with planning actions faster or even alongside the actual implementation. Furthermore, they should also be more open to apply new routines in general. This acceptance could be explained by the level of uncertainty avoidance of an individual (Hofstede, 1991). Which is a promising variable with regard to the operationalization of the frugal mindset.

Bricolage

Baker and Nelson (2005, p. 361) acknowledge that "Not only does improvisation call forth bricolage, but bricolage also sometimes triggers improvisation.". Both concepts thus show certain conceptual differences and should not

be confused with each other. Improvisation is concerned about the temporal order of tasks and the potential new routines that emerge out of a shortened planning period. Baker and Nelson (2005, p. 333) define bricolage as “making do by applying combinations of the resources at hand to new problems and opportunities”. This rather focuses the discussion on the use and perception of resources in respective tasks and routines. In the context of mindsets, **perception** of resources is a very interesting notion. Baker and Nelson (2005, p. 331) summarise that in prevalent literature resources are assumed to be “objective and definable independent of the specific organizations embedded in a resource environment. Resources are what they are, and organizations either have the resources they need or they do not.”. Regarding to (Baker & Nelson, 2005) this view provides an insufficient basis to explain the survival and success of entrepreneurs who embrace new challenges while employing the constrained set of resources they have at hand. A conceptualisation of resources, which allows for a much better explanation of this phenomenon is Penrose’s (1959, p. 67) notion that: “**A resource, then, can be viewed as a bundle of possible services**”. This way one can argue that resources can be used in countless combinations and no firm ever fully grasps the entire range of services offered by their resources (Penrose, 1959, p. 86). This view of perception of the services offered by resources provides fruitful ground for the idea of a frugal mindset. An assumption that intensifies with the suggestions of Baker and Nelson (2005) that:

- Bricolage typically appeared to involve a **general awareness** of existing practices and norms and a conscious willingness to abrogate them
- A consistent behaviour in firms that generate services with physical inputs that others reject is that they **test**

institutionalized definitions of orthodox practice

- Making do implies a **bias toward action** and active engagement with problems or opportunities rather than lingering over questions of whether a workable outcome can be created from what is at hand

These points might well be interpreted as a matter of mindset. A general awareness of existing practices and a willingness to questions these fit well with the mindset characteristics of the first phase of goal oriented behaviour. A testing of institutionalized definition of orthodox practices might then result in a change of practices (phase two of goal-oriented behaviour). A bias towards action to solve the problems at hand is basically what is described in the action phase of goal oriented behaviour. In this case Baker and Nelson (2005) focus their discussion on the role of resources and the services derived from them. This complements our construct and gives a promising hint on how companies that cultivate a frugal mindset can do more with less. They might do so by creatively harnessing services from the resources at hand to fulfil the necessary tasks of developing frugal innovations. Applying bricolage has also empirically been shown to have a positive impact on developing frugal innovations (Ernst, Kahle, Dubiel, Prabhu, & Subramaniam, 2015).

Furthermore, Baker and Nelson (2005) note that in some of their cases bricolage helped firms to grow, because resources were applied to areas, which senior managers viewed as strategic. Also, supervisors were willing to remove limitations and confirmed a tolerance for some shortcuts and problems to get the task done without the need for new resources. This stresses the role of management in applying unconventional practices.

Effectuation

Effectuation describes a decision process in which the actor explores possible effects with the given means (Sarasvathy, 2001). The relevance of effectuation for the frugal mindset seems to be depending on the actor and the market. This leads the discussion to Soni and Krishnans (2014) identification of the three main actors in frugal innovation: grassroots entrepreneurs, domestic enterprises and MNC-subsidaries. Sarasvathy (2001) mainly focuses her discussion on decision making in entrepreneurial contexts. She argues that the effectuation logic is a viable alternative to the reverse goal driven causation process, if the market uncertainty is so high that goals are not clear (Sarasvathy, 2001). This contrast to goal driven decision making seems to cause a general incompatibility with our concept. However, this paper strives to conceptualize the frugal mindset for Western MNCs. Our approach to the frugal mindset along the phases of goal-driven behaviour might not fully apply to grassroots entrepreneurs. Nevertheless, Sarasvathy (2001) proposes that successful early entrants in an industry are more likely to have used effectuation processes than causation processes. For incumbents however, the situation might be the other way around. This indicates that our conceptualization should still apply to MNCs. Therefore, effectuation does not contribute to the theoretical focus of this paper but might indicate an important difference between the mindsets of different actors of frugal innovation.

Mindsets and Path Dependency

Finally, we will contrast the two concepts of mindsets and path dependency. While the frugal mindset is assumed to be an important prerequisite for frugal innovation, path dependencies have been suggested as a phenomenon that imposes “invisible-yet-significant” barriers to frugal solutions (Tiwari

R. , 2016, p. 5). In this context, innovation pathways, which can be influenced by path dependencies, have been compared across India and Germany for the automotive component industry (Kalogerakis, Fischer, & Tiwari, 2017).

While we do not intend to provide an extensive discussion of similarities and interdependencies of mindsets and path dependency, we would like to point out that they are not the same thing. Yet, we think that future research on frugal innovation should appreciate the relevance of both concepts for each other and a connection does exist. We will now develop the respective argument.

Sydow, Schreyögg and Koch (2009, p. 696) define organizational path dependence “as a rigidified, potentially inefficient action pattern built up by the unintended consequences of former decisions and positive feedback processes.”. Hence, path dependency is, first of all, a process. In this process a potentially unconscious regime is established, which causes a certain kind of decision or action pattern and reproduces itself over a certain period of time (Sydow, Schreyögg, & Koch, 2009). Eventually this action pattern is replicated continuously, which might lead the whole organisation into a decision lock-in (Sydow, Schreyögg, & Koch, 2009). On the one hand, the authors suggest that path dependency is influenced by aspects like interorganizational relations, technological pathways and market level effects. This clearly goes beyond the conceptual idea of a mindset. On the other hand, the relevance of individual respond patterns, cognitive schemata, cognitive rigidities as well as cognitive lock-ins are discussed. Sydow, Schreyögg and Koch (2009) also suggest that this cognitive individual level is a topic of great relevance to organizational path dependency, which still awaits further elaboration. Mindsets, which we also discussed as cognitive filters might be a promising

concept to describe these phenomena on an individual level. This hint is intensified by another shared trait. Sydow, Schreyögg and Koch (2009, p. 698) put self-reinforcing mechanisms “at the heart of organizational path dependence”. Here, we recall that according to Gupta and Govinadrajana (2002) mindsets are developed in an iterative way, which makes them a result of people’s history and a prevailing mindset determines the absorption and processing of new information. Hence, information that is compatible with the current cognitive filters, supports the existent mindset. While Gupta and Govinadrajana (2002) suggest that new information might also trigger a re-evaluation of a current mindset, the mechanism discussed above can arguably be regarded as a self-reinforcing one. Therefore, we suggest that mindsets are an important part of path dependencies and the cultivation of a new mindset might support organizations to break from them.

Based on the theoretical discussion, we further explore the frugal mindset with the following assumptions: For Western MNCs the frugal mindset refers to a cognitive orientation that is believed to have a significant impact on an organization’s ability to succeed in the development of frugal innovations and eventually break conflictive path dependencies. Frugal innovation is a multi-faceted endeavor that requires the completion of certain tasks, which can potentially be linked to the phases of goal oriented behavior. These tasks prime as well as require certain mindsets, which refer to cognitive orientations that determine the way individuals absorb and interpret information from the environment. Hence, mindsets influence the perceived reality, determine assumptions, impact decision making and ultimately have an effect on task performance. An organization with a frugal mindset might be more likely to perform tasks in a way that are characterized by improvisation and bricolage.

3 Methodology

This working paper presents the first results in an ongoing study. Before further investigating the frugal mindset on an empirical basis, we conduct a literature review to explore and structure what is already discussed in the scholarly discourse. We searched the GVK+ database and Google Scholar for relevant literature. We searched the title and keywords for the words “frugal innovation” and included articles published until August 16, 2017. We found 59 results in the GVK+ database and 132 results in Google Scholar. 111 publications were redundant within or among the databases or irrelevant, resulting in a database of 80 articles. Based on the previous discussion we conducted a content analysis of the publications for discussions regarding the terms: mind, mindset, mind-set, mindshift, mind-shift, mental(ity), attitude, believe, belief, culture, assumption(s) and socialis(z)ation. 32 articles provided respective information (see Appendix 2). The retrieved information was analyzed and key insights were summarized in first-order codes (Pratt, 2009). In a second round of coding these codes were again analyzed, compared to the theoretical discussion, categorized into second-order codes (Pratt, 2009) and structured into a conceptual framework. The result of these steps were reviewed by two researchers that are not involved in the research project. One reviewer is engaged in the field of frugal innovation for 6 years and one for 2 years. The results of literature review and coding are now discussed.

4 Results

Since the review of relevant theory already provided theoretical insights to the importance and cultivation of mindsets, the systematic frugal innovation related literature review was focused on the conceptualization of the frugal mindset itself. Analyzing, coding and structuring of data resulted in two insights.

Firstly, the discussion mainly focuses on the following three critical organizational **goals** that determine the success of frugal innovation endeavors for Western companies:

- (1) Strategic alignment of innovating for cost conscious consumers, especially in emerging markets
- (2) Deepen the understanding of cognitively remote customers' needs and the context in which they live or work.
- (3) Being able to satisfy these customers' needs with frugal solutions.

These goals are now illustrated by findings from the literature review. Altmann and Engberg (2016) provide a good example of goal (1) with their suggestion that Western companies are advised to develop a **new mindset** that sees cost-conscious consumers as valuable target groups, because less-developed economies emerge as new markets with high potential. Zeschky, Widenmeyer and Gassmann (2011, p. 43) also follow this argumentation and suggest that "(...) Western companies must **change their mindset** and see low-income populations as potential markets that offer great business opportunities for the right products.". Furthermore, they also indicate the necessary prerequisite for business success, which follows after setting the strategic direction of innovating for cost-conscious consumers, **the right product**. However, before being able to develop frugal products, services or business models, Western companies need the ability to reconsider longstanding **underlying assumptions** related to breakthrough R&D (Altmann & Engberg, 2016). This means reconsideration of market **assumptions** that may be valid only in developed economies and **assumptions** related to customer needs that may differ substantially between Western and emerging markets in the first place (Altmann & Engberg, 2016).

Hyvärinen, Keskinen and Varis (2016, p. 888) discussion highlights the iterative nature of mindsets. They indicate that a frugal innovation approach can result in obtaining a new mindset for product development for new markets and that "This process is also likely to highlight the importance of understanding the local context and prevailing constraints as well as the needs and desires in these environments.". An aspect that can barely be stressed enough, because frequently too little time and energy are ascribed to the definition of a problem, which can result in solving the "wrong" problem (Volkema, 1983). Since frugal innovations are reduced to their core functionalities and provide an optimized performance level for their specific use context (Weyrauch & Herstatt, 2016), in-depth knowledge about customer needs is crucial. Finally, organizations need to act on their goals and new customer knowledge and come up with the right solutions. (Tiwari, Fischer, & Kalogerakis, 2017, p. 15) conclude that one important factor revealed by their qualitative study was a **frugal mind-set** needed by engineers working for German companies. Most of their interviewees shared the opinion that "German engineering culture rather appreciates complex high-tech solutions.". Considering that frugal innovations aim to provide the right level of functionality and performance while focusing on significant cost reduction (Weyrauch & Herstatt, 2016), appreciation of high-tech solutions for their own sake can become a serious barrier. Altmann and Engberg (2016) suggest that Western companies need to reconceptualise the role of breakthrough R&D in frugal innovation, because traditionally the access to higher margins is assumed to be enabled by costly and often risky development efforts. In this context (Ojha, 2014, p. 16) reports that for Bosch India "it was so much easier to incorporate a **mindset** of "high-end technology at low costs"" in India than change the mindset in Germany where

high-end technology was normally associated with high costs and hence high prices.". The importance of accepting a high-end technology for low costs or more-for-less paradigm is also stressed in other publications (Radjou & Prabhu, 2015; Zeschky, Widenmayer, & Gassmann, 2011). Sivaprakasam (2015, p. 686) acknowledges all three aspects in her claim that: "(...) the frugally minded innovators **seeing opportunities in emerging markets** are more **acutely aware of the requirements**, such as the need to **keep the costs low** and working with local resources—even if the **functionality offered is limited.**"

Secondly, within the described goals, individuals seem to be confronted with several stages in which they might choose to proceed to adapt a frugal mindset or refuse to do so. Derived from the analysis and coding of the literature these stages are:

- (1) Accepting the new realities of changing markets and competition.
- (2) Re-evaluation of current approach.
- (3) Implementation of adapted approach.

Regarding stage (1), the acceptance of changing circumstances Bhatti, Khilji and Basu (2013, p. 123) suggest **MNCs** "(...) to venture into South Asian markets for business prospects with an **open mind**, in order to engage in learning so as to better **address changing circumstances** not only in South Asian markets but also in their respective home markets globally.". Additionally, their suggestion indicates that an "open mind" has a positive influence on adapting to these changing realities. Nevertheless, simply realising that things are changing around an organization will not result in effectively dealing with these changes. In this context Bhatti (2012) suggests that working under business and social constraints of innovating for extreme customers at the bottom of the pyramid can force firms to **rethink** the process and outcome of innovation. Finally, organizations must also **act according to their**

new approaches. Ramdorai and Herstatt (2015) quote that for GE Healthcare setting up the organization in a way that the team has the empowerment to do things, the team has experienced people to do it, and the team has the right people to actually identify what exactly the need of the local market is was crucial to do so. Furthermore, the respective interviewee suggested that "one cannot succeed in doing so with a R&D/engineering **mindset.**" (Ramdorai & Herstatt, 2015, p. 95). In the context of enacting a frugal way of problem solving Tan, Ky and Tan (2016) suggest that firms must **implement a bricoleur's mindset**, one that allows them to make do with the resource constraints they have in order to **enact** their innovation frugally. A bricoleur's mindset enables identification of resources that can be recombined and repurposed in the interest of efficiency and effectiveness (Tan, Ky, & Tan, 2016).

In line with the assumption that the frugal mindset is a multi-faceted phenomenon several aspects have been identified that characterize such a mindset. Furthermore, we structured these aspects along the dimensions of organizational goals and stages of mindset development. This characterization will now be discussed in further detail, especially with regard to the theory of mindsets.

5 Discussion

Based on the theory of mindsets in the context of the global mindset and the results of the literature review, we will now develop a more detailed characterization of the frugal mindset to guide further theory building and facilitate empirical investigation.

Within the three identified organizational goals of frugal innovation (i.e. setting the strategic direction for frugal innovation, deepening the understanding of the respective customers and developing suitable frugal solutions for their

needs) the literature review revealed three stages in which a frugal mindset can be guided on the individual level. In these stages individuals decide whether they:

- (1) Accept the new realities of changing markets and competition.
- (2) Are willing to reconsider their current approaches.
- (3) Are willing to take the necessary action and implement new approaches.

Compared to the action phases of goal-oriented behavior, these stages show significant conceptual similarities with the first three action phases. Accepting changing circumstances should, if reasonable result in **setting the goal** of adapting the current strategy. For example, a manager might observe a growing market potential in the low or mid end market segments of the Indian market and growing competition from local competitors. If revenues are declining in the high-end segments and market shares are lost to these competitors, (s)he might be well advised to consider including a frugal innovation approach into the firm's innovation strategy. Subsequently, (s)he would analyze the firm's capabilities and resources to **plan** a potential operationalization of the strategy and finally actively **guide** the **implementation**. Hence, we develop our conceptualization based on a combination of the characteristics of action phase related mindsets summarized in Table 1 and the findings of our literature review. Furthermore, we assume that for different functions or positions within an organization the respective goal related mindsets are more or less critical. Referring to the previous example, initially convincing the management of the strategic necessity of innovating for cost

conscious customers in emerging economies might be more important than convincing the sales personnel. However, it would then be the managements' role to "talk the talk" and spread the frugal mindset in the organization (and eventually convince the sales force). Managers of Western companies arguably need to see the necessity of developing frugal innovations to pave the way for their product development teams. If things are to be done differently, management behaviour like support for innovation or providing vision and resources (De Jong & Den Hartog, 2007) is crucial. For the remaining two goals, the situation is more complex. Traditionally, the identification of customer needs is the responsibility of marketing personnel. However, a completed frugal innovation action research project at our institute strongly suggests that developers should be part of these activities, especially in frugal innovation projects (Weyrauch T. , in press). Weyrauch suggests that development engineers have a much better chance to understand customer needs on a much more detailed level, because of their technical knowledge. Furthermore, customer feedback might be filtered until reaching the development engineers, which results in missing detail as well as contextual information. Similarly, developing the right solution at the right costs is a joint achievement of development engineers, production engineers as well as the support of other functions, like ongoing customer feedback from marketing. Therefore, we will ascribe the latter two sub-mindsets to members of innovation teams, in general.

Hence, we propose that a frugal mindset manifests in 9 characteristics, which are connected as illustrated in Figure 1.

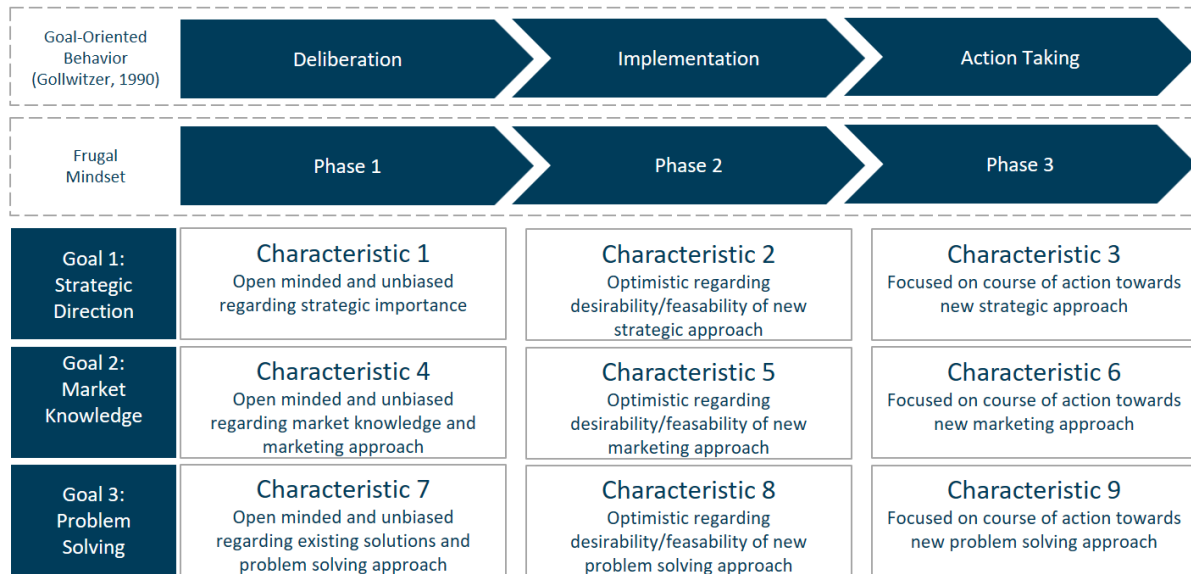


Figure 1 Goal-oriented behaviour, FM phases, frugal innovation goals and FM characteristics

The detailed descriptions of each characteristic can be found in Appendix 2. Derived from our developed characteristics we suggest the following definition of the frugal mindset for Western MNCs:

*“In Western MNCs, a **frugal mindset** describes a cognitive orientation, which results in questioning current assumptions, re-evaluating current approaches and implementing effective actions to develop frugal innovations. The frugal mindset improves **task performance** in attaining the **goals** of strategic alignment of innovating for customers in resource scarce settings, especially in emerging markets, the understanding of cognitively remote market/customer needs and conducting problem solving for the development of frugal solutions.”*

We conducted the literature review to develop a basis for further theory building of the frugal mindset. The results of our approach and possible next steps are now summarized.

6 Conclusion

In order to successfully develop frugal innovations and consequently succeed in respective market segments, it is assumed that Western companies also need to develop a frugal mindset (Soni & Krishnan, 2014; Tiwari,

Fischer, & Kalogerakis, 2016; Zeschky, Widenmayer, & Gassmann, 2011). Therefore, a common understanding of the frugal mindset is crucial. With this objective in mind, we explored the questions why a frugal mindset could be important to realize the potential of frugal innovations for Western MNCs, how can it be conceptualized in this context and can it be cultivated by affected organizations.

Our proposed definition builds on the phases of goal-oriented behavior (Gollwitzer, 1990) and is based on nine characterizations of the frugal mindset. In line with the phases of goal-oriented behavior we propose that a frugal mindset can be cultivated along the phases of:

- (1) Accepting the new realities of changing markets and competition.
- (2) A willingness to reconsider current approaches.
- (3) A willingness to take the necessary action and implement new approaches.

We propose that a frugal mindset is important for Western MNCs because the right mindset for a given task promotes task completion, which in turn results in processing information congruent with the current task and as a result improves task performance (Gollwitzer, 1990).

Consequently, we assume, that greater task performance will have a positive influence on related goals. In the context of frugal innovations, we identified the following three corresponding goals:

- (1) Strategic alignment of innovating for cost conscious consumers, especially in emerging markets
- (2) Deepen the understanding of cognitively remote customers' needs and the context in which they live or work
- (3) Being able to satisfy these customers' needs with frugal solutions

Furthermore, the right mindset might also be an important prerequisite to break away from potentially harmful path dependencies. Building on these two arguments, we suggest the following effects of a frugal mindset. Managers with a frugal mindset are more successful in effectively including cost conscious consumers, especially in emerging markets in their business strategy. Innovation teams with a frugal mindset are more successful in developing an in-depth understanding of cognitively remote customers' needs and the context in which they live or work. Finally, innovation teams with a frugal mindset are more successful to satisfy these customers' needs with frugal solutions.

Regarding the cultivation of mindsets, Gupta and Govindarajan (2002) identified four possible ways for Western companies to cultivate a global mindset. We expect that the mechanisms of new experiences which cause a change in the mindsets of organizational members, a change in the relative power of

different individuals, a change in the organizational and social processes through which members meet and interact with each other, and a change in the mix of members comprising the firm such that the mindsets of new members differ from those departing also apply in the context of the frugal mindset.

The review of literature on frugal innovation as well as relevant fields provided a solid theoretical foundation to conceptualize the frugal mindset and find promising insights to all our questions. However, it does not provide the possibility to validate our concept or explore the interplay between individual and organizational mindsets. In order to further develop our emerging theory, operationalize our concept and develop testable hypotheses, further qualitative research is needed. Possible approaches are interviews or case study research. Future research may then examine the effect of a frugal mindset on a firm's ability to develop frugal innovation and consequently firm performance in respective market segments. Similar approaches in related topics are conducted in the publications of Ernst, Kahle, Dubiel, Prabhu and Subramaniam (2015) or Nummela, Saarenketo and Puumalainen (2004). Furthermore, we did not discuss a potential organizational change towards a frugal mindset in detail. A review of change management literature and an investigation of the completeness as well as effectiveness of the four mindset cultivation mechanisms could provide respective insights. Finally, we suggest that a further elaboration of the frugal mindset and its connection to organizational path dependencies might provide a deeper understanding to both concepts.

7 Appendices

Appendix 1 – Literature Review Coding

Article	Quotation ¹	Mindset Category			Goal Category		
		Deliberation	Planning	Action	Strategy	Marketing	Problem Solving
(Ahuja, 2014)	“promote an entrepreneurial culture” (p.5)			x	x		
(Altmann & Engberg, 2016)	“adopt a new mindset that (...) sees cost-conscious consumers as valuable target groups, (...) abandon preexisting technological trajectories, (...) and rethink product development processes” (p. 49), “reconsider longstanding underlying assumptions” (p. 54), “technological assumptions that may affect the team’s ability to modify existing solutions or develop new ones” (p. 54), “the dominant belief regarding customer preferences” (p. 54), “questioning of existing technical evaluation requirements” (p. 53), “Reconsider market assumptions that may be valid only in developed economies” (p. 54), “Rethink assumptions related to customer needs” (p. 54)	x	x	x	x	x	x
(Annala, Sarin, & Green, 2016)	“mental frames influencing problem solving” (p. 2)						x
(Banerjee, 2013)	“the dominant mindset in the organization, which filters out information that might suggest alternate uses for resources that do not fit within the current paradigm.” (p. 306)	x					x
(Bencsik, Machova, & Tóth, 2016)	“change their mentality (...) to have the strategy successful. This includes the development of creative thinking and innovative ideas, which is the fastest solution to the problems.” (p. 89), “The secret of their success is (..) their mentality. Their aim is – still		x	x			x

¹ This column lists the goals and characterisations used in literature. If articles adopted them from other articles, we do not refer to the original source

	with frugal solutions – to produce products that are valuable and qualitative. Cheapness is not equal to poor quality, and frugal solutions are not extreme cuts.” (p. 90), “values and ways of thinking, which emphasize humans, relationships, knowledge and creativity” (p. 92)						
(Bhatti Y. A., 2012)	“It may be that emerging nations are approaching innovation in a different way that addresses contextual factors, constraints and local demands.” (p. 5), “realize the benefit of innovating for such extreme customers” (p. 26), “rethink both the process and outcome of innovation” (p. 26)	x	x	x	x	x	x
(Bhatti, Khilji, & Basu, 2013)	“venture into South Asian markets for business prospects with an open mind” (p. 123), “(...) frugal innovation can best be understood as a new innovation mindset, process, and outcome, which leverages the challenges of institutional voids and resource constraints to debunk exorbitant research and development (R&D) investments while serving and profiting from underserved consumers.” (p. 129), “assumptions challenged”(p. 144), “a shift in mind-set from value for money to value for many.”	x	x	x			x
(Bhatti & Ventresca, 2013)	“shift in mind-set from value for money to value for many” (p. 16), “It is simply a culture and mindset of creative improvisation required for frugal innovation” (p. 17), “This rethinking exercise on long held assumptions could help to re-evaluate processes and outcomes for problems and applications in both emerging markets and developed markets” (p. 19)		x	x	x		x
(Bound & Thornton, 2012)	“A culture of ‘jugaad,’ or creative improvisation, means the unusual skillset and mindset required for frugal innovation are abundant.” (p. 6), “(...) shift our mindsets from the allocation of resources to their more efficient use.” (p. 12), “principles of seeking opportunity in adversity and methods of doing more with			x	x		x

	less" (p. 21)						
<i>(Gambhir, Singh, Duckworth, & Sotiropoulos, 2012)</i>	"(...) a culture that embraces risk with relish." (p. 7)			x	x		
<i>(Granqvist, 2016)</i>	"(...) culture, which acknowledges the role of civil society in producing innovations and the business opportunities to tackle global challenges." (p. 6), "changing a mind-set of companies from developing highly engineered ready products to technologies which can be adapted to customer needs." (p. 27)						
<i>(Grover, Caulfield, & Roehrich, 2014)</i>	"(...) attitude was slowly changing with efficiency becoming the key strategy for their organizations." (p. 28), " (...) they believed that it was a profitable venture, demonstrating a more rigorous assessment of market knowledge." (p. 28)			x	x	x	
<i>(Hossain, 2013)</i>	"It requires major changes in organizational culture: discarding old organizational structure to create new one, reorientation of product development and innovation method (...)" (p. 4)		x	x	x		x
<i>(Hyvärinen, Keskinen, & Varis, 2016)</i>	"A frugal innovation mind-set can serve as a medium for companies to find new ways to organise products and business development (i.e., innovation processes), and to respond to water-related challenges of the less affluent. Firstly, realizing the opportunities in the water sector beyond the organisations' traditional field of operation opens larger markets." (p. 9), " (...) a frugal innovation approach can enable organisations to (...) obtain new mind-sets and offset for product development for new market segments. This process is also likely to highlight the importance of understanding the local context and prevailing constraints as well as the needs and desires in these environments." (p. 12)		x	x	x	x	x
<i>(Ojha, 2014)</i>	"We believe innovation comes from interacting with customers, i.e. by observing them and figuring out how their businesses or their lives			x		x	x

	can be improved." (p. 12) , "incorporate a mindset of "high-end technology at low costs"" (p. 16),						
(Paninchukunnath, 2013)	"The unique mindset characterized by attributes like adaptability and inclusivity make jugaad innovators adept at innovating faster, cheaper, and better."(p. 156)			x	x		
(Megget, 2014)	"Change of mindset is key to innovation - To innovate in a cost-conscious healthcare market, where the high and often prohibitive price of new drugs is of critical concern, pharma companies must be more agile and responsive to their customer needs. This requires a shift of focus away from why a product is simply 'better' than its competitors to whether it is directly cost effective and how it can save money in the long term." (p. 43)			x		x	x
(Pinto, 2012)	"An innovatively frugal mindset means you are more acutely, and urgently, attentive to your environment." (p. 1)	x					
(Radjou & Prabhu, 2015)	"Attempts to shift R&D away from its' technology culture must be aided by new measurements and key performance indicators." (p. 39), "Specifically, Western managers need to adapt a frugal mindset." (p. 198), "(...) IBM is attempting to reinvent its business model, and its senior managers' mental models, by gradually shifting its innovation focus to emerging Asia and Africa." (p. 199), "a frugal innovation culture built around agility, deep understanding of customer needs and usage patterns, and partnerships with start-ups." (p. 206)			x	x	x	x
(Rai, 2015)	"(...) an affective atmosphere of being 'nimble-minded and nimble-footed' in the context of 'emerging markets, (...)" (p. 987)			x	x		
(Ramdorai & Herstatt, 2015)	"You can't just run this whole thing with an R&D/engineering mindset."			x			x
(Saha, Dahiya, &	"Frugal innovation (...) requires creative mindsets,			x		x	x

<i>Sarkar, 2016)</i>	understanding of the intricacies of the bottom of the pyramid's expectations (...)" (p. 131)						
<i>(Sivaprakasam, 2015)</i>	"(...) the frugally minded innovators seeing opportunities in emerging markets are more acutely aware of the requirements, such as the need to keep the costs low and working with local resources—even if the functionality offered is limited." (p. 686), "a culture underpinned by a shared goal in terms of delivering value through frugal approaches." (p. 699)		x	x	x	x	x
<i>(Soni & Krishnan, 2014)</i>	"(...) an improvised solution born from ingenuity and cleverness", "Applying combinations of the resources at hand to new problems and opportunities", "Identification of ends with the means given while being focused on affordable losses", "Agents create new routines by improvising on the existing ones while performing those", "Innovation driven by affordability and sustainability, than by premium pricing and abundance approach", "Development and implementation of new ideas which aspire to create opportunities that enhance social and economic wellbeing for disenfranchised members of society." (p. 34)			x	x		x
<i>(Tan, Ky, & Tan, 2016)</i>	"As firms seek to innovate, they must undertake a bricoleur's mindset, one that allows them to make do with the resource constraints they have in order to enact their innovation frugally. This mindset allows for the identification of resources that can be recombined and repurposed in the interest of efficiency and effectiveness."			x			x
<i>(Tiwari R. &, 2012)</i>	"(...) a new way of thinking that creates attractive, good-enough products that can be offered in basic versions and "stripped up" to match individual wishes (...)" (p. 26)			x			X
<i>(Tiwari, Fischer, & Kalogerakis, 2017)</i>	"(...) German engineering culture rather appreciates	x		x			x

	<p>complex high-tech solutions.”, “German engineers often tend to emphasize technical product characteristics and, in case of doubt, would rather add an additional feature than delete it.”, “(...) engineers generally expect to be rewarded for the development of new complex solutions.”, “Hence, in order to successfully develop frugal solutions a new mind-set would need to spread.” (p. 15) “(…) a more rigorous and cautious analysis of expenditures in foreign subsidiaries:” (p. 17)</p>						
<i>(Tiwari, Fischer, & Kalogerakis, 2016)</i>	<p>“(…) mentally adopt the goals of frugal innovation. Only if they overcome their tendency to develop complex technologies and if the entire company appreciates frugal innovations, will companies succeed with this new innovation model. “ (p. 19), “(...) the necessary mind-sets and corporate culture motivating product developers to innovate frugally and not value their product merely by the price-tag it commands.” (p. 23)</p>		x	x	x		x
<i>(Wohlfart, Bünger, Lang-Koetz, & Wagner, 2016)</i>	<p>“a shift of mind-set in established R&D teams: from the design of sophisticated high-end products to a philosophy of reduction” (p. 6), “simulate this attitude”, “(...) helps innovators to come up with simplified technical approaches that perfectly match user requirements.” (p. 16)</p>		x	x			x
<i>(Zeschky, Widenmayer, & Gassmann, 2011)</i>	<p>“Western companies must change their mindset and see low-income populations as potential markets that offer great business opportunities for the right products.”, “However, the key to success will be the attitude of the development team, which must be oriented toward meeting a radical cost goal.” (p. 43), “Successful frugal innovation begins in the mind”, “they must understand the unique characteristics of frugal products: very high customer benefits at very low costs.”, (p. 44)</p>		x	x	x		x

<p><i>(Zeschky, Widenmayer, & Gassmann, 2014)</i></p>	<p>“Local competitors for example in China are more willing to make trade-offs: Chinese customers cannot afford the best technology. So, they give them the best they can buy for their money. That is a mind-set that has been difficult for people in the US and Germany to get their heads around.” (p. 264), “These engineers (with a frugal mindset) are consequently much better able to design products which meet the requirements of these customers.” (p. 271)</p>		<p>x</p>	<p>x</p>			<p>x</p>
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Appendix 2 – Frugal Mindset Characteristics

Characteristic 1

Initially, managers with a frugal mindset are characterized by an open-mindedness and heightened receptivity to information regarding the strategic importance of innovating for potential customers of frugal innovations. They are oriented towards accurate and unbiased processing of the relevant information and show a cognitive tuning toward information relevant to its desirability and feasibility.

Characteristic 2

In the planning phase, managers with a frugal mindset are characterized by closed-mindedness in the sense of concentrating on information that helps to promote the implementation of a frugal innovation strategy. They show a cognitive tuning toward information relevant to when, where, and how to act. Therefore, they are optimistic regarding the analysis of information related to the chosen goal's desirability and feasibility.

Characteristic 3

In the execution phase, managers with a frugal mindset are characterized by closed-mindedness to information that could trigger a re-evaluation of a set frugal innovation strategy or a re-evaluation of the chosen route of its implementation. They show a cognitive tuning

toward internal and external cues that guide the course of action toward goal attainment.

Characteristic 4

Initially, individuals of market research teams with a frugal mindset are characterized by an open-mindedness and heightened receptivity to information regarding the necessity of reconsidering existing market and customer knowledge and respective research approaches. They are oriented towards accurate and unbiased processing of the relevant information and show a cognitive tuning toward information relevant to its desirability and feasibility.

Characteristic 5

In the planning phase, individuals of market research teams with a frugal mindset are characterized by closed-mindedness in the sense of concentrating on information that helps to promote the re-evaluation of existing market and customer knowledge as well as the respective research approaches. They show a cognitive tuning toward information relevant to when, where, and how to act. Therefore, they are optimistic regarding the analysis of information related to the chosen goal's desirability and feasibility

Characteristic 6

In the execution phase, individuals of market research teams with a frugal mindset are characterized by closed-mindedness to information that could trigger a re-evaluation of the necessity to create new market and customer knowledge as well as respective research approaches or a re-evaluation of the chosen route of its implementation. They show a cognitive tuning toward internal and external cues that guide the course of action toward goal attainment.

Characteristic 7

Initially, individuals of teams engaged in problem solving² with a frugal mindset are characterized by an open-mindedness and heightened receptivity to information regarding the necessity of re-evaluating existing problem solving approaches and their potential of providing frugal outcomes. They are oriented towards accurate and unbiased processing of the relevant information and show a cognitive tuning toward information relevant to its desirability and feasibility.

Characteristic 8

In the planning phase, individuals of teams engaged in problem solving with a frugal mindset are characterized by closed-mindedness in the sense of concentrating on information that helps to reconsider the existing problem solving approaches and their potential of providing frugal outcomes. They show a cognitive tuning toward information relevant to when, where, and how to act. Therefore, they are optimistic regarding the analysis of

information related to the chosen goal's desirability and feasibility

Characteristic 9

In the execution phase, individuals of teams engaged in problem solving with a frugal mindset are characterized by closed-mindedness to information that could trigger a re-evaluation of the necessity to apply new problem solving approaches or a re-evaluation of the chosen route of implementation. They show a cognitive tuning toward internal and external cues that guide the course of action toward goal attainment.

² In this context problem solving is used as a broad term to describe the process of providing solutions at the back end of innovation. Thus, it includes activities like product or service development, business model design and planning of production as well as the marketing strategy. Based on the insights of market and customer research.

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